

Oregon, Rhode Island, Utah, and Washington Territory. There was no state or territory from which thunder-storms were not reported, except Delaware, there being no stations of observation in that state.

Table showing the number of stations in the several states and territories reporting thunder-storms for each day during August, 1888.

Table showing the number of stations in the several states and territories reporting number of days during August, 1907.																																	Total No. of days.
State or Territory.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.		
Alabama.....			2	3	3	1	1		1	3	1	2		1	1	17	18		1	3	2								2	3	1	19	
Arizona.....	1	2								3	2		3	2	6	4					2	4	1	3	4	2	2	2	3	3	4	19	
Arkansas.....	1	1	1	1				1		1	1					1													1	1		15	
California.....	1	1																														3	
Colorado.....	3		1	4		2				2	3	3	3	3	1	3	2	1	2		2	1							3	1	1	30	
Connecticut.....			1	5													4															3	
Dakota.....	6	4		10	6	1		1		3		1	5	5				3		2							1	1	1			10	
District of Columbia.....					1			1		1																						5	
Florida.....	2	4	3	4	6	6	4	4	4	4	4	4	3	1	2	2			3	3		3	2	3	4	1	2		2	2	1	27	
Georgia.....	2	2	4	3	3	1	3	4	4	2	3	4	2					2	1	1	1	1	1					2	3	1	2	23	
Idaho.....	2																															1	
Illinois.....	10	5	19	10	5	21	21	4	1	1	6	8	1	6	10	11	8	1	2	5	15	1			8	6	2	1		3	6	28	
Indiana.....	3	4	3	7		3	4	3	1	1	1	4				4	5	3					1	2	7	3						18	
Indiana Territory.....		1	1	1			2	2	1							1	1			2							2	1	1			12	
Iowa.....	8	6	10	5	13	17	10	1	3	15	7	3	3	25	26	7	1	6	1	5	10				2					2	3	25	
Kansas.....		4	13	7	9	8	12	1	1	3	5	3	1	4	3	5	1	2	8	3	1		1		3	5	8	6	2	5	1	28	
Kentucky.....	2	1	1	3		1	1					1					1	2			1				1	2	1					14	
Louisiana.....	3	1	4	2	2		1	6	3	5	4	2		1	2	4	2	3	5	4	2	3	1	4	1		1	4	4	4	3	28	
Maine.....																										5	2	3				7	
Maryland.....	1			1	3			4					3				2					1										8	
Massachusetts.....		1	1	4		1											6				3	2					5					7	
Michigan.....	1	15	11	6		4	4	1		2	1			4	4	13	1			1	4		1	1		1	3	3		9	7	22	
Minnesota.....	3	8		7	7			1	1	1			1	3	1	2	1		3													13	
Mississippi.....			2	1					1		1		1				1		1										1	2	2	10	
Missouri.....	2		5	4	5	5	5	1		2	1		1			1	1	1	1	4	1				3	1	2	2		1	2	22	
Montana.....	1	4	3	2	1			1		1		1	1				1		1								2					18	
Nebraska.....		6	6	7	9	4			1	7	3	1		6	8	1		1	3	5	2											3	
Nevada.....																1	1			1												8	
New Hampshire.....								1							1	1	1	1								1	2	2				12	
New Jersey.....	2			4	3			5		1	6			3	3	1				4							1	4				17	
New Mexico.....	2								2			1			1	2	2	1	3	3	4			2	2	2		1	2	1		13	
New York.....			3	12		3	8					2	1			7	5					1					4	3				14	
North Carolina.....		2	2			1	1	4	5	3	2	1	4					1	3		1											21	
Ohio.....	5	3	12	11	1		13	1	1		3	16		6	1	9	3	1		3	2						1	2		1	1	5	
Oregon.....	1																															18	
Pennsylvania.....	2		5	17	8	1	1	12	2		1	21	13	7	1							3					1	9	1			1	
Rhode Island.....																																20	
South Carolina.....		6	8	4	3		3	7	12	8	1	2	2							5	2	4						1	2	6	8	26	
Tennessee.....	1	3	12	8	8	1	3	7	3	1	4	3		1	1	4	6	10	5	3	3						2	4	2	4	10	27	
Texas.....	4	4	2				3	4	6	1	2	4	5		2	2	3	5	9	3	1		4	6	4	3	4	5	4	7	3	4	
Utah.....	1													2	1	1																18	
Vermont.....	1			1			1	3	1		1			1	1	3	2	1								1	3	3	1	1		3	
Virginia.....	5	1	2	1	5	1	2	6	4		1	5					2	3	5	4	2	1										2	
Washington.....	2	1																														9	
West Virginia.....			1	2	1		1	1				3				1	1	1														12	
Wisconsin.....		6	5	2	1	1	1	1						5	4	7		1		1										4	1	15	
Wyoming.....	6	2				2	1	1			1	3	1	4	2																		
Number of States reporting.....	30	26	29	34	22	21	23	29	22	17	26	28	18	19	21	30	25	25	21	19	23	17	9	7	15	19	24	18	20	23	23		

MISCELLANEOUS PHENOMENA.

DROUGHT.

Lynchburg, Va., 9th: reports from Appomattox county state that while some sections of that county have had partial rains there are other portions where the rain during the past two months has not been sufficient to wet the ground, and corn and tobacco are suffering in consequence.

Palestine, Tex., 9th: the severe drought which caused some damage to crops, especially to cotton, was broken on this date.

Oak Grove, Christian Co., Ky., 10th: corn and tobacco in this section have suffered much injury from the dry weather.

Nashville, Tenn.: the rain, 1.56 inches, which fell between the 16th and 18th broke the drought, which has been very severe for the past two weeks.

Winnemucca, Nev., 21st: stock men report a great scarcity of water on the ranges, and that the stock is suffering in consequence; the springs in the mountains are drying up.

Sebastian, Fla., 23d: on account of the continued dry weather the oranges in this section are falling from the trees.

Petersburg, Va., 31st: the drought in the southern counties of Virginia has become very serious; in some sections there has been very little rain for several months, and the crops are scorched; all creeks and small streams are drying up.

Pueblo, N. Mex., 31st: owing to the dry weather stock men in this and adjoining counties have moved their cattle to Kansas; little or no hay has been cut, except where water for irrigation was to be had, and in some sections entire crops were lost on account of insufficient water supply.

Birmingham, Oakland Co., Mich., 31st: the drought during the month has been most severe; in many places the farmers

are unable to plow their land, the dry soil reaching the depth of four feet below the surface.

Thornville, Lapeer Co., Mich.: the month has been very dry, corn has been greatly injured, and pastures are almost all killed by drought.

FOREST AND PRAIRIE FIRES.

Los Angeles, Cal.: extensive fires prevailed about Anaheim, in the Upper Santa Anna Valley, and below Norwalk, Los Angeles Co., on the 13th. Smoke from large mountain fires was observed over the Sierra Madre range northeast of this city on the 22d and 23d.

Ishpeming, Marquette Co., Mich.: forest fires burned on all sides of this village and extended on both sides of the railroad for many miles on the 27th. Several buildings were burned.

Helena, Mont.: on the 31st a disastrous prairie fire raged on the ranges in northern Montana, extending from Maria River to the Sweet Grass Hills, a distance of fifty miles; the winter range of the Fenton and Saint Louis Cattle Company was destroyed with a large amount of hay.

Forest and prairie fires occurred also as follows: Fort Sill, Ind. T., 1st to 7th; Fort Reno, Ind. T., 3d to 7th, 14th; Red Bluff, Cal., 11th to 20th, 23d to 28th; San Diego, Cal., 25th.

HALOS.

The dates on which solar halos were observed over the greatest extent of territory during August were the 7th, 14th, 16th, 20th, 27th, and 31st; they were least numerous on the 1st, 2d, 4th to 6th, 7th to 9th, 13th, 22d to 25th, 28th, and 30th. They were observed on from eight to twenty dates in Illinois,

Mississippi, Ohio, and Tennessee; Illinois reporting the maximum. In the remaining states they were either not observed at all or on very few dates.

But few lunar halos were reported from the 1st to 13th, there being seven days during that period on which none were reported; from the 14th to 20th they were observed in from five to fifteen states and territories, and during the balance of the month they were of rare occurrence. They were seen on from five to twelve days in Alabama, Connecticut, Illinois, Missouri, New Jersey, New York, Pennsylvania, Tennessee, and Virginia; in the remaining states and territories they were either not observed at all or on a small number of dates.

The phases of the moon, Washington mean time, during August, as given in "The American Ephemeris and Nautical Almanac," are as follows: new moon, 7th, 1h. 12.7m.; first quarter, 13th, 23h. 35.8m.; full moon, 20th, 23h. 12.1m.; last quarter, 28th, 21h. 9.7m.; apogee, 13th, 18.9h.; perigee, 27th, 19.6h.

METEORS.

Sebastian, Fla.: a meteor, apparently one-half the size of the full moon, was observed in the east at 6.50 p. m., 12th; it moved in a westerly direction, and when about 10° from the horizon it exploded with a loud report like that of a cannon; the meteor left a long trail in its path which lasted about thirty seconds. It is reported that the same meteor was seen and heard to explode about ten miles from this place.

The following is taken from "Science" of September 14th:

Mr. A. B. Knight, of Butte City, Montana, reports that on the evening of August 19th a brilliant meteor was observed from that city, and the following is the results of observations made by Mr. J. C. Mayo: "At 6.35 p. m. (local time) a meteor burst into view in the southern heavens, and moved in an apparent downward and northeasterly direction. About two seconds (estimated) after its appearance the meteor burst, first into two parts, and then into fragments, which disappeared. At the expiration of five minutes and thirty seconds two loud reports, nearly simultaneous, were heard. These reports were like the explosion of heavy blasts of powder, and were followed by a rumbling, like near thunder, lasting about ten seconds. The place in the sky where the meteor was first seen was S. 60° E. from the Blue Bird Mine, at an elevation of 50° from the horizon. The place where it burst was due east and at an elevation of 25°. The meteor was a well defined body, egg-shaped, with the smaller end foremost. This body was distinctly visible, 'resembling white-hot iron', giving off a pure white light, and was followed by a 'bright blaze', which shaded into a dense white, 'sulphurous' smoke. The trail of smoke left behind remained visible for fully ten minutes. The sky was clear and the sun shining brightly, but the meteor apparently emitted as much light as the sun, and lighted up its shadows."

The meteor above referred to was also observed at Deer Lodge, Boulder, Helena, and Virginia City, Mont.

Fort Maginnis, Mont.: a brilliant meteor was observed, moving from a point a little east of north in a westerly direction, at 9 p. m., 19th; the meteor, when passing, lit up the surrounding objects.

Brock's, Emery Co., Utah: a brilliant meteor was observed in the northeast at an altitude of 60°, moving in an easterly direction, at 7.22 p. m., 21st, and disappearing when about 2° above the horizon; the meteor left a reddish train of light, which lasted about one and three-quarter seconds. Twelve meteors were observed from evening twilight until 11.30 p. m., 22d, moving from the zenith to the horizon in the eastern and northern sky; each emitted a bright light like the electric light, and lasted from one-half to three-quarters of a second.

Salina, Saline Co., Kans.: a brilliant meteor, of fiery red color, was observed, moving from southeast to northwest, at 9 p. m., 29th; during its flight the sky was lighted up as if by bright moonlight for fully fifteen seconds. This meteor was also seen at Manhattan and other points in Kansas.

Meteors were also observed as follows: 1st, Auburn, Ala.; Dudley, Mass.; Kalamazoo, Mich. 2d, Kalamazoo, Mich.; Fort Stanton, N. Mex.; Cleburne and Mesquite, Tex. 3d, Manatee, Fla.; Kalamazoo, Mich.; Collinwood, Ohio; Cleburne and Mesquite, Tex. 4th, Yuma, Ariz.; Pekin, Ill.; Kalamazoo, Mich.; Cleburne and Mesquite, Tex. 5th, Yuma, Ariz.; Webster, Dak.; Archer, Fla.; Boise City, Idaho; Kalamazoo, Mich.; Cleburne and Mesquite, Tex.; Marion, Va. 6th, Keeler, Cal.; Manatee, Fla.; Kalamazoo, Mich.; Utica, N. Y.; Quakertown, Pa.; Cleburne and Mesquite, Tex.; Marion, Va. 7th, Fort Stanton, N. Mex.; East Portland, Oregon; Quakertown, Pa.; Stateburg, S. C.; Cleburne and Mesquite, Tex.; Lynchburg and Marion, Va. 8th, Pekin, Ill.; Vevay, Ind.; Garrettsville, Ohio; Mesquite, Tex.; Deuster, Wis. 9th, Auburn, Ala.; Yuma, Ariz.; Duke, Fla.; Cedar Rapids, Iowa; Lexington, Ky.; Dudley, Fall River, and Somerset, Mass.; Winnemucca, Nev.; Wauseon, Ohio; Quakertown, Pa.; Austin and Memphis, Tenn.; Brownsville, Tex. 10th, New Market, Ala.; Prescott, Ariz.; Lead Hill, Ark.; Sacramento, Cal.; Webster, Dak.; Cedar Keys, Fla.; Charleston, Ill.; Cedar Rapids, Iowa; Blue Hill Observatory, Dudley, Fall River, and Somerset, Mass.; Kalamazoo, Mich.; Biloxi, Miss.; Winnemucca, Nev.; Beverly, N. J.; Brownsville, Tex.; Lynchburg, Marion, and Rappahannock, Va. 11th, Lead Hill, Ark.; Cedar Rapids, Iowa; Kalamazoo, Mich.; Saint Vincent, Minn.; Moorestown, N. J.; Marion and Rappahannock, Va.; Deuster, Wis. 12th, Keeler, Cal.; Jacksonville, Ill.; Kalamazoo, Mich.; Brownsville, Tex. 13th, Kalamazoo, Mich. 14th, Kalamazoo, Mich.; Wauseon, Ohio; Brownsville and Mesquite, Tex. 15th, Kalamazoo, Mich.; East Portland and McMinnville, Oregon; Quakertown, Pa.; Brownsville and Mesquite, Tex. 17th, Monticello, Iowa. 18th, East Portland, Oregon. 19th, Boise City, Idaho; Virginia City, Mont.; Utica, N. Y. 21st, East Portland, Oregon; Mesquite, Tex. 22d, Jacksonville, Ill.; Vevay, Ind.; Beverly, N. J. 23d, Yuma, Ariz.; Windsor, Ill.; Kalamazoo, Mich.; Brock's, Utah. 24th, Jacksonville, Ill.; Vevay, Ind.; Dudley, Mass.; Kalamazoo, Mich. 25th, Keeler, Cal.; Pekin, Ill.; Kalamazoo, Mich.; Egg Harbor City, N. J. 26th, Woonsocket, Dak.; Dudley, Mass. 27th, Dudley, Mass.; Biloxi, Miss.; Eden Centre, N. Y.; Wauseon, Ohio; Quakertown, Pa. 28th, Keeler, Cal.; Vevay, Ind.; Clarinda, Iowa; Manhattan, Topeka, and Yates Centre, Kans.; Dudley, Mass.; Tecumseh, Nebr. 29th, Glenwood, Iowa; Dudley, Mass.; Beverly, N. J. 30th, Kalamazoo, Mich.; Collinwood, Ohio; Cleburne, Tex.; Deuster, Wis. 31st, Jacksonville, Ill.; Helena, Mont.

MIRAGE.

Kitty Hawk, N. C.: a mirage was observed to the east, north, and south of this place from 9.48 to 11.10 a. m. 22d; vessels eight miles from shore appeared in both natural and inverted positions; life-saving stations thirty miles north of here appeared very near and elevated along the beach; and forests were depicted in the sky in an inverted position.

Mirage was also observed as follows: Davenport, Dak., 9th, 12th, 15th, 19th, 22d; Webster, Dak., 4th, 18th, 19th, 21st to 25th, 28th, 29th, 31st; Hampton, Iowa, 2d, 28th; Moorhead, Minn., 12th, 15th; Marquette, Nebr., 23d, 29th.

SAND STORMS.

Rio Grande City, Tex., 5th to 8th, 19th; Fort Grant, Ariz., 12th, 15th; Fort McDowell, Ariz., 13th, 14th, 24th; Winnemucca, Nev., 16th, 17th.

VERIFICATIONS.

INDICATIONS FOR 36 HOURS IN ADVANCE.

The percentages of verifications of the bi-daily indications for July, 1888, as determined from comparison of succeeding telegraphic reports, are given in the table below.

The predictions for districts east of the Rocky Mountains for July, 1888, were made by Assistant Professor H. A. Hazen, and those for the Pacific coast were made by 2d Lieutenant Joseph E. Maxfield, Signal Corps; the verifications for all districts were determined by Assistant Professor C. F. Marvin.